APPLICATION OF PROJECT MANAGEMENT TO OPTIMIZE LOGISTICS AND REDUCE RISKS FOR A DO-IT-YOURSELF PERSONAL VEHICLE BUMPER REPLACEMENT IN ALASKA

By

Leslie Thomas Stokes, B.S.

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APPROVED:

Roger Hull, B.S., PMP, Committee Chair
LuAnn Piccard, M.S., PMP, Committee Member
Jim Bates, MBA, PMP, Committee Member

LuAnn Piccard, M.S., PMP, Chair

Department of Project Management

Kenrick Mock, Ph.D., Interim Dean

College of Engineering

Abstract

In Alaska, coordinating logistics is regularly a disadvantageous factor that can lead to unsuccessful projects. Improper schedules and the impacts of unplanned risks can severely affect proper completion of a vehicle modification, especially in the do-it-yourself arena where project documentation is almost non-existent. Insufficient risk and response planning can delay or cause the termination of a venture.

In the Application of Project Management to Optimize Logistics and Reduce Risks for a Do-It-Yourself Personal Vehicle Bumper Replacement in Alaska Project, the risks of selecting an appropriate replacement bumper, performing a factory bumper removal, and completing a replacement bumper installation were identified and analyzed in order to create a living toolkit of threats and opportunities. The potential or actual effects of the risks on the schedule, as well as mitigation and response measures taken were recorded. The overall project schedule includes a timeline from developing the project management plan through the replacement process. Risk and logistics management documents are strictly related to the procurement and replacement processes. Manuals comprised of procurement analysis and instructions for product installation that supplement the manufacturer's instructions have been produced as deliverables. Final deliverables will be presented to the committee along with follow-on operational tasks continuing to contribute additional procedures or tools deemed prudent by the organization.

Keywords and Phrases

Automotive modification
Vehicular modification
DIY Bumper Swap
Ram 1500 Bumper
Risk identification
Shipping to Alaska

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Application of Project Management to Optimize Logistics and Reduce Risks for a Do-It-Yourself Personal Vehicle Bumper Replacement in Alaska

Background

Vehicle modification has occurred since the invention of the automobile. From day-to-day repairs, racing, off-roading, and performing construction duties, there has become a market in the automotive industry for changing vehicles "just because". When approaching the modification of a large investment, such as a personal vehicle, there can be a significant amount of risk assumed and time involved. Typically, modifications will not be compliant with local, state, or federal laws. Many individuals take the vehicle to an Automotive Service Excellence (ASE) Certified mechanic, who are knowledgeable with regional legalities. These mechanics can also reduce downtime for invested parties' primary method of transportation, and can transfer any risk away from unskilled practices. That ASE certification adds significant cost to any type of service desired; even when tasks can be completed with hand tools alone. Individuals who wish to perform the modification themselves have little to no formal projects documented for source material when undertaking an automotive project, which begins with selecting products, and follows through to completion.

Furthermore, a key challenge to undertaking projects with potentially oversized items needing to be shipped is location. Location can be a key challenge for procurement in Alaska. When considering shipping to this state, weather and transport are two significant factors, as well as other challenging variables that many companies and individuals are not accustomed to account for when living in the contiguous United States. There are a multitude of companies that will not even venture to make shipments to the Alaska, and those who do often incur and transfer the hefty fees associated with shipping. The costs of shipping combined with a limited number of summer months make for challenges when conducting a project in Alaska, where a climate-controlled workspace may not be available.

Scope Description

The Application of Project Management to Optimize Logistics and Reduce Risks for a Do-It-Yourself Personal Vehicle Bumper Replacement in Alaska project, referred to in this document as APM, determined legal capability prior to performing the replacement of a front factory installed bumper on a 2020 Ram® 1500 Pickup truck with an aftermarket, high clearance, steel bumper, and optional skid plate. The bumper has an expected lifespan for the duration of ownership of the vehicle and was shipped to Alaska for less than 30% of its Manufacturer Suggested Retail Price (MSRP) set by the manufacturer. The bumper and optional skid plate were modified as determined by the Project Manager to allow for improved aesthetic, durability, and driving capability. Modifications included color matching and protective coating. These modifications were determined by schedule allowances and Project Manager's best judgement and are included in the risk analysis.

Throughout execution and closing, a manual has been developed to supplement the manufacturer's installation manual and will benefit interested parties who embark upon similar automotive modifications. The manual describes the experience of installation not included in the manufacturer's instructions. Along with the supplementary installation manual, procurement analysis was developed during the planning phase. In addition to analysis, the procurement document takes readers through relevant legal considerations to be taken and sources available for research when altering a personal vehicle. The procurement document shows the process this project used to select a bumper, which considered costs and coordinating logistics in Alaska.

Risk identification and analysis were conducted by commencing the initiation phase through the execution of installation, and results that include preliminary risk analysis and impact estimation, along with risks realized and are included as an appendix supplemental to the project narrative.

The project had a strict completion of execution required for prior to the Fall 2020 academic semester commencing to accommodate Project Manager's prior obligations, and a project closeout completion no later than December 1, 2020.

Objectives

The strategic goal for the APM project is to perform a vehicular modification venture that includes: the replacement of factory bumper, installation of increased clearance performance suspension, performance modifications, and other aesthetic alterations. The operational level goals were to complete the removal of factory bumper, the installation of aftermarket bumper with optional skid plate, and documentation of work processes. High level objectives have been identified in Exhibit 3, which supports the operational level goals. Alaskan winter conditions prevent working in external climate conditions, which allows the adequate resources to accumulate to make the best determination for product needs and to address potential risk impacts.

Exhibit 1: Table of Objectives

Goal	Objective
Replace front bumper	Minimize cost Appease aesthetic Increases capability
Write narrative	Complete process relating to procurement and installation outlined Post to online community to help others interested in similar projects
Complete ahead of schedule	Utilize winter season to plan and initiate project Develop schedule to track status and adjust performance as necessary.

Deliverables

The deliverables from the project were the removal of the factory bumper, procurement and installation of an aftermarket bumper, procurement and installation of an optional skid plate, a written narrative of the process from conception through installation that shows the application of project management tools and techniques for projects like this, the development of procurement comparisons for bumpers and retailers that will ship the selected bumper to Alaska, an installation manual that supplements the manufacturer's, the creation of a schedule that will guide the project timeline that included academic deadlines, risk analysis documentation for schedule and duration impacts of anticipated and realized risks, and all Master of Science in Project Management deliverables assigned from the University of Alaska, Anchorage.

Research Method

Throughout the APM project, an internet search engine was used to guide the product and installation research. Following diligent research for methodology containing any relevant project management information regarding a do-it-yourself (DIY) automotive project the Project Manager determined that there are no existing results for academic texts related to guiding DIY automotive projects or non-assembly line automotive projects; with this in mind, this project is a (known) first of its kind, and followed established The Guide to the Project Management Body of Knowledge guidelines regarding project development, execution, and closing. Currently, there are three prior students' Project Management Plans within the Consortium Library that have been published regarding risk of DIY projects that were utilized. They were used for formatting outlines and content guides.

Product research was conducted through manufacturers', suppliers', and retailers' websites, along with user experiences from online forum groups which the Project Manager is a member. This research helped to finalize acceptable finished product criteria.

Disassembly and installation methods were researched through manufacturers' resources, YouTube DIY videos, Google image searches and the "5th Gen Rams" forum website for subject matter experts of the 2019 and newer model Ram trucks.

Results of Project Research

After researching bumper removal and installation utilizing online resources, the Project Manager determined that the manual labor of the project could not be completed without someone present to assist. This risk was planned for when developing the plan for this project. By utilizing a mechanic, an unforeseen opportunity presented itself by having someone present to document the process through photography and video logs. Another unplanned risk occurred when transferring the factory bumper's proximity system onto the aftermarket counterpart due to insufficient length of wire between sensors; following modification by splicing extensions onto the wires, this issue was resolved and installation proceeded. With assistance from an experienced mechanic, the installation culminated successfully based on the criteria for the project. During testing, it was determined that the modification to the location of proximity sensors rendered the sensors inoperable due to a change in calibration needed. With this not affecting operation of the vehicle and following thorough research and outreach to the online community where other customers have encountered similar issues, the PM determined that the realized risk was acceptable. With the bumper not being deemed original equipment by vehicle manufacturer, the dealership where the vehicle was purchased would not consider uncovering underlying issues with the defect.

Project Management Approach and Outcomes

Initiation

In January 2020 the initiation phase for the Application of Project Management to Optimize Logistics and Reduce Risks for a Do-It-Yourself Personal Vehicle Bumper Replacement in Alaska project defined the Activities that would be included in the project. The scope development included all academic and project-specific activities that would be tracked. The primary project knowledge areas that were selected to demonstrate mastery were risk and procurement management.

The project's initial plan began development while the Project Manager owned a Blue Streak 2019 Ram 1500 half-ton pickup truck. Effective risk, procurement, and change management allowed the project to continue with minor changes of scope due to a change in project vehicle to a Granite Crystal 2020 Ram 1500 half-ton pickup truck on February 29, 2020. This change went through the change control process by being approved by the Project Manager and was documented in the change control log.

Planning

Transitioning to the planning phase brought around major changes to every project environment that must be annotated. COVID-19 became prevalent as a new global pandemic. With the sudden impacts from this pandemic, there was no sensible way to plan for risk or risk responses.

While still in the project planning phase, the Project Manager began conducting thorough product research to best develop the risk register and determine what mitigation measures would be utilized, and what responses would be taken to realized risks. The effects of the project research conducted were an effective risk mitigation measure for all aspects of the project. It was during this phase that the Project Manager determined the need to bring on additional personnel resources to be able to successfully complete the project. The thorough research performed resulted in ten risks being realized during execution and closing, and of those ten, only three had been unplanned. Exhibit 2 shows the three unplanned risks that were accepted with the complete Risk Toolkit which can be found in Appendix 4.

Exhibit 2: Unplanned Realized Risks

Task Name	Threat (T) / Opportunity (O)	Impact Type	Description of Risk
Bumper interferes with safety equipment	T	Scope	proximity sensors lose functionality (common)
3rd party records process	O	Scope	Mechanic has assistant that keeps portfolio of work
PM overallocated	T	Scope	PM assigned new role that detracts from ability to devote work toward capstone

During project planning, procurement analysis also occurred in the form of narrowing the results of available products down to select a bumper for installation. This analysis is shown in Appendix 1 and shows the process by which a bumper was selected for the project. The project financier and co-financier gave authority to purchase the Pro-Mod bumper, which is manufactured by Westin® Automotive and sold through Amazon. Following delivery, assembly went as expected with everything necessary to assemble having been shipped with the product. Utilizing the established change management process, the Project Manager granted authority and documented to have the bumper powder coated to match the vehicle, which would provide increased resistance to corrosion, and improved aesthetic appeal.

The project management plan was created and submitted for approval throughout the first two quarters of the spring of 2020. This included developing the full scope of the project and all subsidiary plans such as the change management plan, procurement management plan, risk management plan, stakeholder management plan, and schedule management plan.

Execution

The planned work required for the disassembly of factory equipment and installation of the aftermarket bumper was seven and one-half hours and was completed in that amount of time as demonstrated by Exhibit 3 (from Appendix 3). The installation would have been expedited had the realized risk of the proximity sensors needing to be extended not occurred.

Exhibit 3: Scheduled Execution

56	✓		4	**Phase IV - Execution**	**431.5 hrs**	**431.5 hrs**	**Fri 4/10/20**	**100%**	**Wed 7/8/20**
57	✓		4.1	Disassemble factory equipment	2 hrs	2 hrs	Fri 4/10/20	100%	Fri 4/10/20
58	✓		4.2	Install Aftermarket Product	5.5 hrs	5.5 hrs	Mon 4/13/20	100%	Mon 4/13/20
59	✓		4.3	Conduct Testing	40 hrs	40 hrs	Tue 4/14/20	100%	Fri 5/1/20

Monitoring and Controlling

Monitoring and Controlling was performed throughout the project, utilizing the schedule developed with Microsoft Project and implementing agile schedule management to meet deadlines and track progress. With the Project Manager being the sole resource for most of the project and having direct responsibility for each task being completed, the critical path was every task that was executed in the project schedule.

Closeout

Overall, the biggest setback in project completion came towards the end of the project during project closeout. Overallocation of the project manager came as an unexpected factor due to the severe impacts to the economy following COVID-19. The reason behind the unexpected overallocation was due to two position changes that increased the project manager's workload tremendously. Most of this increase came during the first two months after taking on the positions and beginning the Tuckman's Stages of Group Development - forming process of balancing the new responsibilities and increased time requirements.

Project Lessons Learned

Throughout the APM project, a common takeaway was to document as done. What this means is that as soon as possible after a task is complete, document details surrounding the task and update the schedule to accurately reflect the occurrence of the task. It ensures accuracy and prevents build-up of tasks. The importance of this is abundantly clear for a DIY project of this caliber because when doing the work, there are details that are subtle and less memorable that could have had a substantial impact on the method or time required to complete the project.

Most changes that were experienced during the project were related to changes in the scope. Looking at the type of project, changes were expected, as the entire scope was subjectively developed without prior experience in this type of project, and as such, specific changes were not anticipated, and went through the change control process to document when those changes were made and why.

Furthermore, it is important to maintain contact with all stakeholders as they require, which is set forth in the stakeholder requirements matrix to maintain positive relations with positive stakeholders, or

to improve relationships with indifferent or negative stakeholders; even over periods of inactivity in a project; ensuring the communication of project progress is important to stakeholders not directly involved with all of the outcomes. One area in which stakeholder management could have been improved for this project would have been to include stakeholders in the change control process to ensure that each change was assumed effective to them.

With the Project Manager being the sole resource for most of the project, and having direct responsibility for each task being completed, the critical path was every task that was executed in the project schedule.

Once labor was complete and project closing began, the over-work resulted in project fatigue. Fortunately, the schedule created was used to keep on time according to the plan. A key takeaway is that the project schedule is developed to plan for what needs to be complete for a project, but also is necessary to ensure all stated deliverables are completed on time after the work is finished to tie up loose ends in the project.

For lessons learned relating to project procurement and installation experiences, reference Appendix 10.

Conclusions

Through the execution of the Application of Project Management to Optimize Logistics and Reduce Risks for a Do It Yourself Personal Vehicle Bumper Replacement in Alaska project, it can be determined that it is possible to implement project management tools and techniques to perform a DIY automotive project in order to influence the results through the planning and analysis of risk and procurement. This has been demonstrated through meeting the following critical success factors outlined in the project management plan:

- New bumper assembled and installed no later than August 30, 2020
- Manual complete by December 4, 2020
- Risk toolkit completed by December 4, 2020
- Submission of final project report to University of Alaska Project Management Department

Further Research Recommendations

The project performance risk identification and analysis tool kit that was developed for this project will be used and further developed for other projects of its kind. The tools and methodology developed will be applied when the Project Manager sees fit to execute future strategic projects in the portfolio, such as adding auxiliary lighting.

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Appendix

Procurement Analysis

Prior to beginning any modification project on a daily-driven vehicle, State legislation must be consulted to avoid fines and conform to acceptable public use road equipment. There are two primary authorities referenced for vehicle modification projects; these are the State Department of Transportation (DOT) and Society of Automotive Engineers (SAE). Most people new to the automotive industry use these terms interchangeably.

Each of these are prominent, however, only one of them determines legality of modifications. For example, SAE is utilized widely, especially in lighting modifications, for vehicles to assess light output and patterns of forward and rear facing lighting qualifications. However, it is the Department of Transportation that implements limitations on what is and is not legal. The DOT is the determining authority to follow for colors permitted to the public vehicles in forward/rearward facing lights. To simply utilize a product that is SAE approved, and not by the DOT is asking for potential problems with authorities when driving on public roads.

This authority extends to body modifications. Certain states' DOT publish regulations prohibiting a bumper that is a certain number of inches above the ground for public road use. Information regarding any guidelines by state can be found on AAA's website. Legality is one of the most easily overlooked portions when modifying the vehicle. Based on experience when interacting with automotive aftermarket retailers, one of the most common occurrences is a customer requesting a product install which they have purchased that is not within the state DOT's guidelines (e.g. bead-lock wheels, forward facing blue/red lights, LED driving lights, etc.).

Following legality determination, research began for products and their cost. The following spreadsheet (see next page) was developed and used to assist in visualizing cost across products and retailers:

Exhibit 4: Procurement Comparison Table

Manufacturer	Model	amazon.com	carid.com	bumpersuperstore.com	autoanything.com	summitracing.com	americantrucks.com	Manufacturer Website*
Addictive Desert Designs	ADD W/ Winch		$ 2,444.37	$ 2,342.52	$ 2,444.37	$ 2,342.52	$ 2,342.52	$ 2,414.97
	ADD W/O Winch		$ 2,036.97	$ 2,036.97	$ 2,036.97	$ 2,036.97	$ 2,036.97	$ 2,099.97
DV8	DV8 / Trail FX		$ 949.99	$ 921.49			$ 949.99	
Fab Fours	FF Matrix		$ 1,849.99	$ 1,675.99		$ 1,849.99		$ 2,000.00
	FF Matrix with Prerunner Bar	$ 1,924.99	$ 1,924.99	$ 1,924.99		$ 1,924.99		$ 2,100.00
	FF Vengeance		$ 1,849.99	$ 1,849.99		$ 1,849.99		$ 1,950.00
	FF Vengeance with Prerunner Bar		$ 1,989.99	$ 1,989.99		$ 1,989.99		$ 2,100.00
Go Rhino	Go Rhino BR5.5		$ 1,224.91		$ 1,572.80			$ 1,572.80
Iron Cross	Iron Cross Hardline		$ 1,495.00	$ 1,495.00			$ 1,495.00	$ 1,495.00
Westin	Westin Outlaw (with skid plate	$ 1,156.23	$ 1,152.98		$ 1,152.98		$ 1,536.94	$ 1,015.29
	Westin Pro-Mod (with skid pla	$ 997.11	$ 1,049.98		$ 1,049.98		$ 1,397.27	$ 1,154.98
Ranch Hand	Ranch Hand Summit		$ 1,195.00	$ 1,101.19	$ 1,195.00			$ 1,195.00

*MSRP from manufacturer; some manufacturers do not ship; this is a baseline for expected purchase price. Lower price than value in this column is considered positive risk

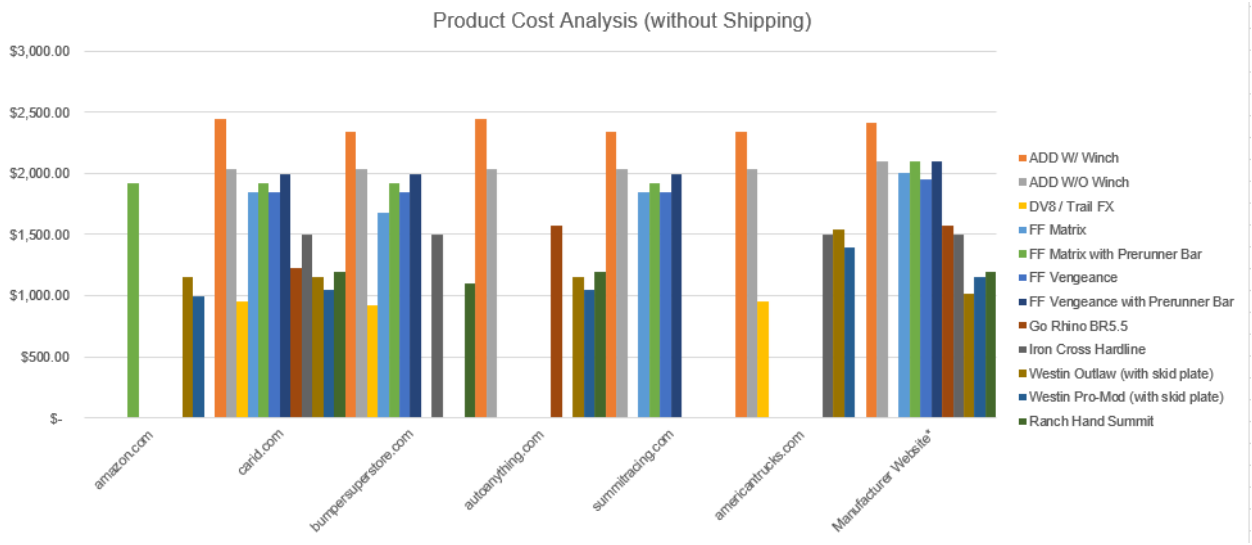
The one highlighted cell is a product that would have a skid plate ordered with it, and the specific retailer or manufacturer did not have the part available or listed.

Empty cells are products from each website that are either not sold, or not in stock and result in blank segments in following histograms.

Shipping was not included in overall analysis due to many online resources not offering quotes for freight shipping to Alaska unless product is ordered. Addictive Desert Design's website quoted a range from $400-$1200 for shipping outside of the continental 48 states depending on specific location and product ordered; this was used as a rough estimation for other manufacturers offering the same option and was a consideration when narrowing to final product selection.

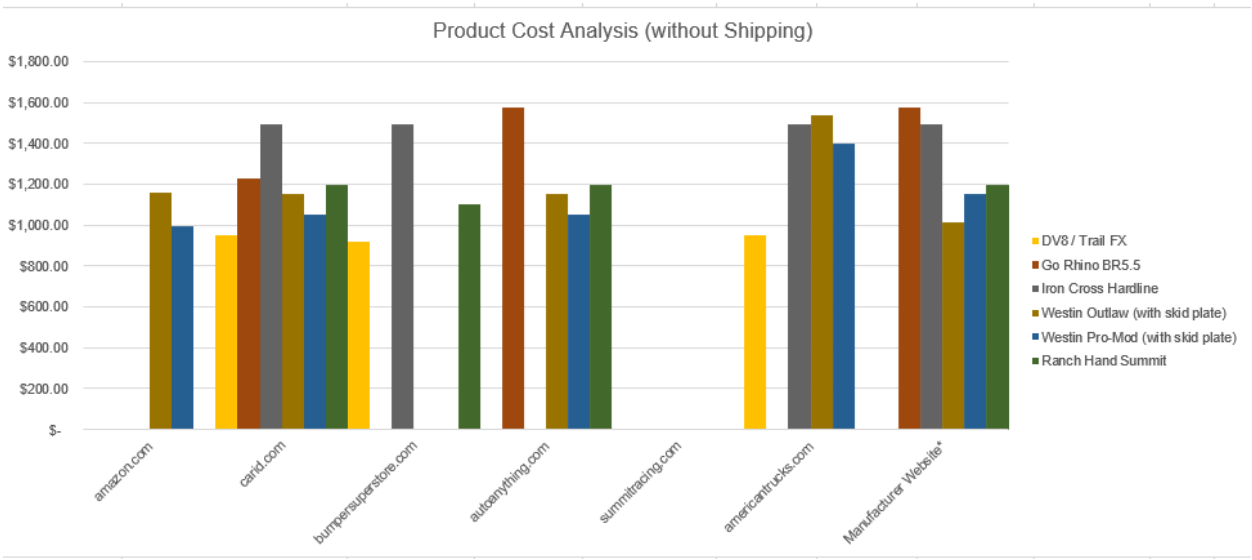
Original graphic depiction of data was compiled prior to filtration to see overall range of costs by product from each website.

Exhibit 5: Procurement Histogram I



Setting a high limit of $1600 on product cost resulted in more accurate target data to see and would prevent exceeding budget if shipping were to become a significant factor.

Exhibit 6: Procurement Histogram II



Narrowing to the five remaining products is much more manageable to allow for a decision to be made. While DV8 / Trail FX bumper trends lower than any of the competition (with $921.49 from bumper superstore being the lowest cost of all), the product is a bit bulky for the owner and offers no undercarriage protection available, so we continue to the next products. Westin Automotive comes in under $1000 from Amazon just above DV8 / Trail FX with their Pro-Mod at $997.11 combined cost for

bumper and skid plate ordered separately. This product fits owner's needs and taste. Following identification of the product, the next step was to determine logistics. Routinely, Amazon will not deliver such oversized items to Alaska. In this case, shipping for the bumper was possible, with a cost of $27.99, and zero cost shipping for the skid plate.

Exhibit 7: Stock Photograph

*Image taken prior to conducting installation

This guide has been developed with the intent to assist in the removal of factory installed equipment, specifically the front bumper of a 2020 Ram 1500. It is not meant to replace the Fiat Chrysler Automobiles manual or the Westin Automotive instruction manual (see Manufacturer Installation Manual), but is meant to suplement with real world experience and photographs and alleviate questions potentially encountered during removal. Some redundancies will appear from other manuals in the interest of explaining in context and to ease the transition from one step to the next.

Safety and Preparation

Prior to beginning work on a vehicle, the vehicle should be parked on a level surface (if possible). Regardless of the surface, emplace wheel stops (chock blocks) on the side of the wheel that the vehicle is most likely to travel and engage the emergency brake to prevent the vehicle from rolling and causing injury or damage. If working with vehicle's electrical systems, then disengage the battery wires to not short out any systems and prevent electricution.

Useful tools:

- Battery or air-powered rachet (3/8")
- SAE and Metric socket set
- SAE hex key socket set
- Open-ended wrench set
- Adjustable crescent wrench
- Wire cutters and strippers
- 24 AWG wire (2 to 3 feet should suffice)
- Crimpable wire connectors

Disassembly and Removal

Begin by removing front section of front wheel-well liners (either side). Then unscrew three bolts (each side) holding the bumper to the frame. Unclip harness connecting fog lights and proximity sensors (if equipped) to Body Control Module (BCM) – this is located on the driver side behind where the section of wheel-well liner was prior to removal.

After disconnecting harness, remove bolts (six total) securing the bumper to the frame. The bumper has gaskets that line the top between plastic trim and bumper that makes for a secure fit. It will take more force than expected to work the bumper away from the body.

Exhibit 8: Beginning Disassembly

Exhibit 9: Removal of Factory Bumper

Exhibit 10: Bumper Removed

Once the bumper is removed, there will be some disassembly of the factory pieces required to be able to detach the wiring harness

Exhibit 11: Transferring Electrical I

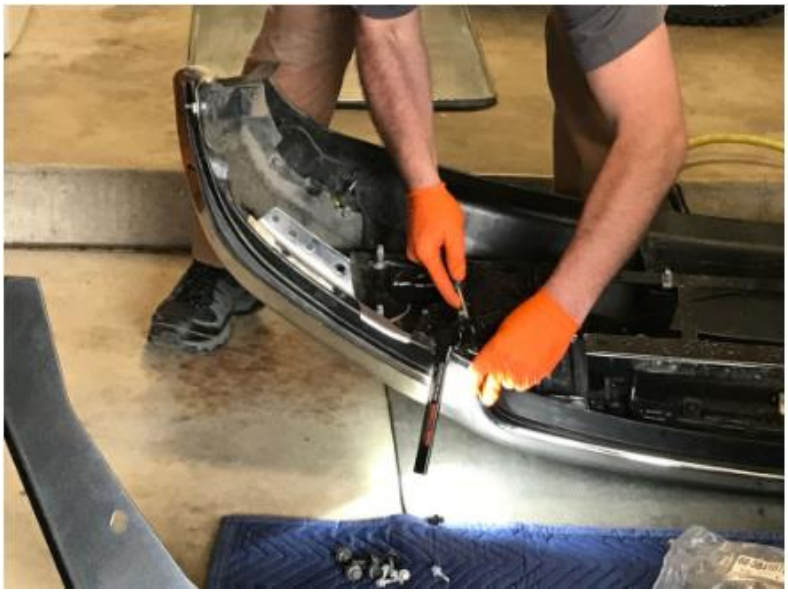
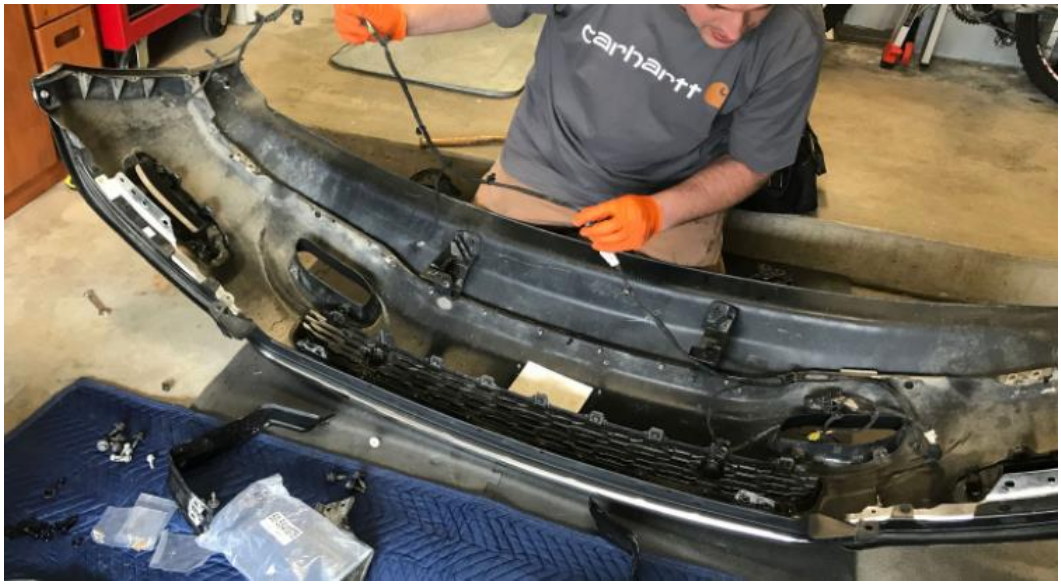


Exhibit 12: Transferring Electrical II

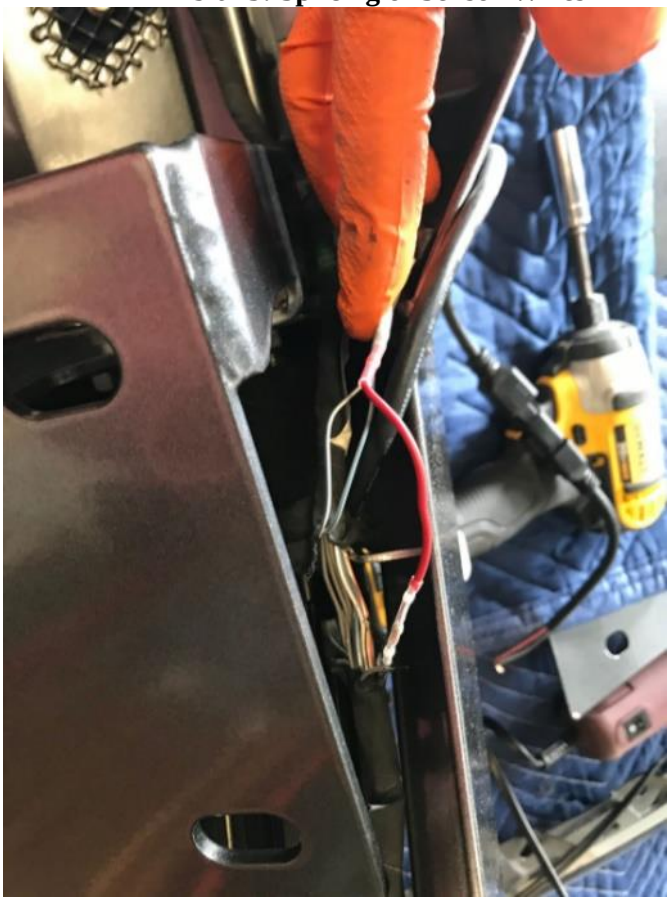
Exhibit 13: Transferring Electrical III

Exhibit 14: Wiring Harness



For this bumper, there was modification to the factory harness required to adapt the proximity sensor location to fit the distance between the mounting location from the stock bumper to the aftermarket bumper. The instructions mention ensuring to note the orientation of the sensors on the factory unit prior to removing to be able to mount the sensors in the **exact** same orientation on the new bumper. This is a KEY step to be able to achieve functionality. Even mis-orienting one of the sensors will render them inoperable. Having completed this step, the sensors can disconnect from the wiring harness to be able to transfer and mount them onto the new bumper. Next measure the wiring harness length between each sensor connector and then carefully splice the wire extensions in. To get to the actual wires the black factory wire wrap (like electrical tape) will need to be removed to reveal enough wire to be able to extend.

Exhibit 15: Splicing of Sensor Wires



Aftermarket Installation

Exhibit 16: Installation of Bumper

Exhibit 17: Installation of Skid Plate

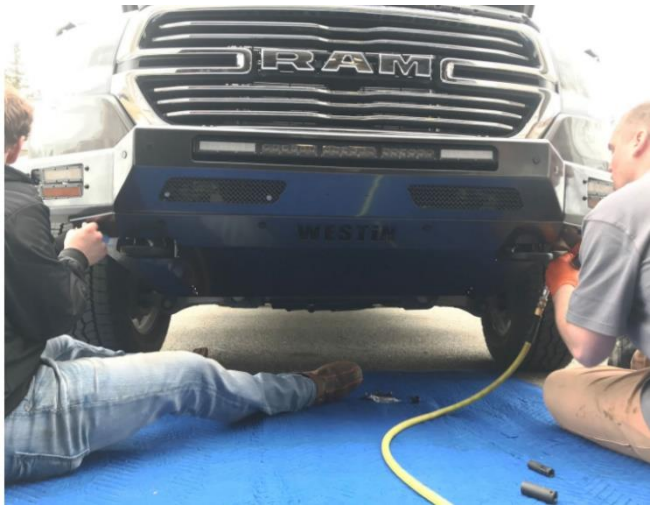


Exhibit 18: Final Product

Results

Final cost for procuring the Westin Automotive Pro-Mod bumper to Chugiak, Alaska came out to $1025.10. Other research utilized was to learn the process of removal of factory hardware and as such, has no metrics to measure other than completion of the labor.

Exhibit 19: Pro Mod Front Bumper

Exhibit 20: Pro Mod Skid Plate

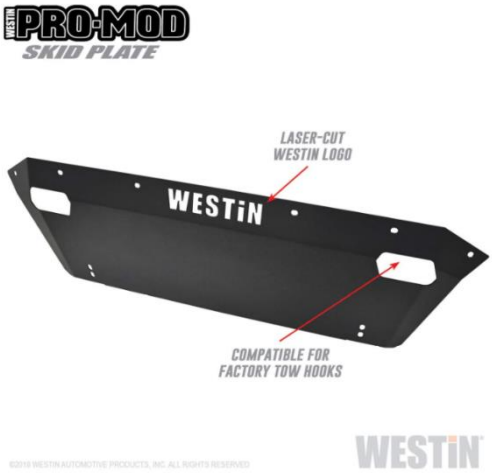


Exhibit 21: Manufacturer Model Vehicle

Project Schedule

		T M	WBS	Task Name	Work	Actual Work	Start	% Complete	Finish
0	✓		**0**	**Application of Project Management to Optimize Logistics and Reduce Risks for a Do It Yourself Personal Vehicle Bumper Replacement in Alaska**	**935.39 hrs**	**935.39 hrs**	**Thu 1/30/20**	**100%**	**Fri 11/27/20**
1	✓		**1**	**Phase 1 - Planning**	**148.04 hrs**	**148.04 hrs**	**Thu 1/30/20**	**100%**	**Thu 4/9/20**
2	✓		**1.1**	**PM686A- Deadline 1**	**25 hrs**	**25 hrs**	**Thu 1/30/20**	**100%**	**Tue 2/11/20**
3	✓		1.1.1	Perform Stakeholder Identification and Analysis	3 hrs	3 hrs	Thu 1/30/20	100%	Thu 1/30/20
4	✓		1.1.2	Develop and Submit Project Charter	3 hrs	3 hrs	Mon 2/3/20	100%	Mon 2/3/20
5	✓		1.1.3	Create Preliminary Schedule and WBS	1 hr	1 hr	Tue 2/4/20	100%	Tue 2/4/20
6	✓		1.1.4	Write and Submit Abstract	4 hrs	4 hrs	Wed 2/5/20	100%	Thu 2/6/20
7	✓		1.1.5	Write and Obtain Signature for Sponsor Letter	2 hrs	2 hrs	Thu 2/6/20	100%	Thu 2/6/20
8	✓		1.1.6	Submit Preliminary GSP	1 hr	1 hr	Fri 2/7/20	100%	Fri 2/7/20
9	✓		1.1.7	Determine Knowledge Areas and Measures	3 hrs	3 hrs	Sun 2/9/20	100%	Mon 2/10/20
10	✓		1.1.8	Write and Submit Preliminary PMBOK Contribution narrative	8 hrs	8 hrs	Tue 2/11/20	100%	Tue 2/11/20
11	✓		**1.2**	**PM686A- Deadline 2**	**42 hrs**	**42 hrs**	**Wed 2/12/20**	**100%**	**Fri 3/27/20**
12	✓		1.2.1	Develop Scope Statement	4 hrs	4 hrs	Wed 2/12/20	100%	Wed 2/12/20
13	✓		1.2.2	Develop and Submit Requirements Documentation	4 hrs	4 hrs	Wed 2/12/20	100%	Wed 2/12/20
14	✓		1.2.3	Update Schedule and WBS	3 hrs	3 hrs	Thu 2/13/20	100%	Thu 2/13/20
15	✓		1.2.4	Create TOC for PM Plan and Final Report	8 hrs	8 hrs	Fri 2/14/20	100%	Fri 2/14/20
16	✓		1.2.5	Develop Research Sources and Key Words	2 hrs	2 hrs	Sat 2/15/20	100%	Mon 2/17/20
17	✓		1.2.6	Determine Preliminary research Methods and Approach to Analysis	4 hrs	4 hrs	Sun 2/16/20	100%	Tue 2/18/20
18	✓		1.2.7	Obtain Signed Student Advisory Contract	2 hrs	2 hrs	Mon 2/17/20	100%	Fri 3/27/20
19	✓		1.2.8	Establish and provide Proof of IRB account	8 hrs	8 hrs	Thu 2/13/20	100%	Thu 2/13/20
20	✓		1.2.9	Determine Knowledge Areas and Measures	2 hrs	2 hrs	Fri 2/14/20	100%	Fri 2/14/20
21	✓		1.2.10	Update and Elaborate PMBOK Narrative (expected outcomes, unique applications, etc)	3 hrs	3 hrs	Mon 2/17/20	100%	Mon 2/17/20
22	✓		1.2.11	Review 3 prior PM plans	2 hrs	2 hrs	Tue 2/18/20	100%	Tue 2/18/20
23	✓		**1.3**	**PM686A- Deadline 3**	**34.04 hrs**	**34.04 hrs**	**Thu 2/20/20**	**100%**	**Mon 3/30/20**
24	✓		1.3.1	Write and Submit Draft of PMP	1 hr	1 hr	Thu 2/20/20	100%	Thu 2/20/20
25	✓		1.3.2	Revise and Submit Abstract	5 hrs	5 hrs	Fri 2/21/20	100%	Fri 2/21/20
26	✓		1.3.3	Describe and Submit how expected research methods will be used and analyzed	6 hrs	6 hrs	Mon 3/16/20	100%	Mon 3/16/20

		T N	WBS	Task Name	Work	Actual Work	Start	% Complete	Finish
27	✓		1.3.4	Write a Description of expected outcomes of project	18 hrs	18 hrs	Tue 3/17/20	100%	Mon 3/30/20
28	✓		1.3.5	Update Gantt Chart	1 hr	1 hr	Thu 3/19/20	100%	Thu 3/19/20
29	✓		1.3.6	Give an Update on Knowledge areas	2 hrs	2 hrs	Thu 3/19/20	100%	Fri 3/20/20
30	✓		1.3.7	Complete IRB Training and Provide Proof	1.04 hrs	1.04 hrs	Fri 3/27/20	100%	Mon 3/30/20
31	✓		**1.4**	**PM686A- Deadline 4**	**39 hrs**	**39 hrs**	**Mon 3/30/20**	**100%**	**Wed 4/8/20**
32	✓		1.4.1	Obtain Advisor approval for research instruments and methodology	1 hr	1 hr	Mon 3/30/20	100%	Tue 3/31/20
33	✓		1.4.2	Submit Complete Presentation of Objectives, charter, pmp, and description of deliverables	6 hrs	6 hrs	Tue 3/31/20	100%	Wed 4/1/20
34	✓		1.4.3	Update/Revise Final PMP	16 hrs	16 hrs	Wed 4/1/20	100%	Fri 4/3/20
35	✓		1.4.4	Update on 3-4 knowledge areas applied and measured during initiation/planning	4 hrs	4 hrs	Fri 4/3/20	100%	Mon 4/6/20

		T N	WBS	Task Name	Work	Actual Work	Start	% Complete	Finish
36	✓		1.4.5	update on 3-4 knowledge areas to meause project execution (if different)	4 hrs	4 hrs	Mon 4/6/20	100%	Tue 4/7/20
37	✓		1.4.6	Update Gantt/WBS	8 hrs	8 hrs	Tue 4/7/20	100%	Wed 4/8/20
38	✓		**1.5**	**PM686A- Final Deliverables**	**8 hrs**	**8 hrs**	**Wed 4/8/20**	**100%**	**Thu 4/9/20**
39	✓		1.5.1	Prepare and Give Final Presentation	8 hrs	8 hrs	Wed 4/8/20	100%	Thu 4/9/20
40	✓		**2**	**Phase 2 - Initiation**	**141.5 hrs**	**141.5 hrs**	**Mon 3/2/20**	**100%**	**Fri 4/3/20**
41	✓		**2.1**	**Research Products**	**46 hrs**	**46 hrs**	**Mon 3/2/20**	**100%**	**Thu 3/19/20**
42	✓		2.1.1	Research Legality	2 hrs	2 hrs	Mon 3/2/20	100%	Tue 3/3/20
43	✓		2.1.2	Research Competitors Products	40 hrs	40 hrs	Tue 3/3/20	100%	Mon 3/9/20
44	✓		2.1.3	Research Existing Lessons Learned	3 hrs	3 hrs	Tue 3/10/20	100%	Thu 3/19/20
45	✓		2.1.4	Determine Additional Equipment needed for Install	1 hr	1 hr	Thu 3/12/20	100%	Thu 3/19/20
46	✓		**2.2**	**Order Product**	**40 hrs**	**40 hrs**	**Thu 3/12/20**	**100%**	**Thu 3/19/20**
47	✓		2.2.1	Buy Bumper and wait for shipping	40 hrs	40 hrs	Thu 3/12/20	100%	Thu 3/19/20
48	✓		2.3	Perform Intentory of Product	2 hrs	2 hrs	Fri 3/20/20	100%	Fri 3/20/20
49	✓		**2.4**	**Quality Assurance Check**	**2 hrs**	**2 hrs**	**Fri 3/20/20**	**100%**	**Fri 3/20/20**
50	✓		2.4.1	Determine that bumper and components are not damaged	1 hr	1 hr	Fri 3/20/20	100%	Fri 3/20/20

		T M	WBS	Task Name	Work	Actual Work	Start	% Complete	Finish
51	✓		2.4.2	Piece together components to ensure proper fit	1 hr	1 hr	Fri 3/20/20	100%	Fri 3/20/20
52	✓		2.5	Assemble Product	3.5 hrs	3.5 hrs	Fri 3/27/20	100%	Fri 3/27/20
53	✓		2.6	Powdercoat Bumper	48 hrs	48 hrs	Fri 3/27/20	100%	Fri 4/3/20
54	✓		**3**	**Phase III - Scheduled Downtime**	**40 hrs**	**40 hrs**	**Fri 4/3/20**	**100%**	**Thu 4/9/20**
55	✓		3.1	Self - Train Installation	40 hrs	40 hrs	Fri 4/3/20	100%	Thu 4/9/20
56	✓		**4**	**Phase IV - Execution**	**431.5 hrs**	**431.5 hrs**	**Fri 4/10/20**	**100%**	**Wed 7/8/20**
57	✓		4.1	Disassemble factory equipment	2 hrs	2 hrs	Fri 4/10/20	100%	Fri 4/10/20
58	✓		4.2	Install Aftermarket Product	5.5 hrs	5.5 hrs	Mon 4/13/20	100%	Mon 4/13/20
59	✓		4.3	Conduct Testing	40 hrs	40 hrs	Tue 4/14/20	100%	Fri 5/1/20
60	✓		4.4	Prepare Documents for Project Closeout	384 hrs	384 hrs	Fri 5/1/20	100%	Wed 7/8/20
61	✓		**5**	**Phase V - Closeout**	**174.35 hrs**	**174.35 hrs**	**Fri 7/10/20**	**100%**	**Fri 11/27/20**
62	✓		**5.1**	**PM686B- Deadline 1**	**26 hrs**	**26 hrs**	**Fri 7/10/20**	**100%**	**Mon 10/5/20**
63	✓		5.1.1	Deliver Status Update	8 hrs	8 hrs	Fri 9/18/20	100%	Fri 9/18/20
64	✓		5.1.2	Deliver PMP Update	2 hrs	2 hrs	Fri 9/18/20	100%	Fri 9/18/20
65	✓		5.1.3	Update RTM	3 hrs	3 hrs	Fri 7/10/20	100%	Mon 7/13/20
66	✓		5.1.4	Update WBS	1 hr	1 hr	Mon 7/13/20	100%	Tue 7/14/20
67	✓		5.1.5	Update Gantt	2 hrs	2 hrs	Tue 7/14/20	100%	Wed 7/15/20
68	✓		5.1.6	Update Risk Register	4 hrs	4 hrs	Wed 7/15/20	100%	Fri 7/17/20
69	✓		5.1.7	Report Risk Responses	1 hr	1 hr	Mon 9/28/20	100%	Mon 9/28/20
70	✓		5.1.8	Update Data collection/research	1 hr	1 hr	Sun 10/4/20	100%	Mon 10/5/20
71	✓		5.1.9	Secure/submit signed GSP	4 hrs	4 hrs	Mon 9/14/20	100%	Tue 9/15/20

		T M	WBS	Task Name	Work	Actual Work	Start	% Complete	Finish
72	✓		**5.2**	**PM686B- Deadline 2**	**32.08 hrs**	**32.08 hrs**	**Mon 9/28/20**	**100%**	**Fri 10/16/20**
73	✓		5.2.1	Update and Submit Abstract	2 hrs	2 hrs	Sun 10/4/20	100%	Tue 10/6/20
74	✓		5.2.2	Update and Submit Table of Contents	1 hr	1 hr	Mon 10/5/20	100%	Mon 10/5/20
75	✓		5.2.3	Update and submit research sources and Key Words	1 hr	1 hr	Sun 10/4/20	100%	Mon 10/5/20
76	✓		5.2.4	Complete and submit (including validation) Research Analysis	6 hrs	6 hrs	Sun 10/4/20	100%	Tue 10/6/20
77	✓		5.2.5	Prepare and Submit Project Status Report	2 hrs	2 hrs	Thu 10/1/20	100%	Fri 10/2/20
78	✓		5.2.6	Update and submit PMP	12 hrs	12 hrs	Thu 10/1/20	100%	Mon 10/5/20
79	✓		5.2.7	Update and Submit RTM	1 hr	1 hr	Mon 10/5/20	100%	Mon 10/5/20
80	✓		5.2.8	Update and Submit Schedule and WBS	5 hrs	5 hrs	Mon 9/28/20	100%	Fri 10/2/20
81	✓		5.2.9	Update and Submit Risk Register	1.04 hrs	1.04 hrs	Mon 9/28/20	100%	Mon 9/28/20
82	✓		5.2.10	Prepare and submit Project Status Report	1.04 hrs	1.04 hrs	Fri 10/16/20	100%	Fri 10/16/20
83	✓		**5.3**	**PM686B- Deadline 3**	**29.27 hrs**	**29.27 hrs**	**Mon 10/19/2**	**100%**	**Tue 10/27/20**
84	✓		5.3.1	Complete and Submit Working Draft of Paper	27.46 hrs	27.46 hrs	Tue 10/20/20	100%	Mon 10/26/20
85	✓		5.3.2	Revise/Submit Abstract	0.23 hrs	0.23 hrs	Mon 10/26/2(	100%	Tue 10/27/20
86	✓		5.3.3	Submit Research/Analysis Results	0.12 hrs	0.12 hrs	Mon 10/26/20	100%	Tue 10/27/20
87	✓		5.3.4	Document/Submit Preliminary Conclusions and Deliverables	0.46 hrs	0.46 hrs	Mon 10/26/20	100%	Tue 10/27/20

		T M	WBS	Task Name	Work	Actual Work	Start	% Complete	Finish
87	✓		5.3.4	Document/Submit Preliminary Conclusions and Deliverables	0.46 hrs	0.46 hrs	Mon 10/26/20	100%	Tue 10/27/20
88	✓		5.3.5	Update/Submit Schedule	1 hr	1 hr	Mon 10/19/2(	100%	Mon 10/19/2(
89	✓		**5.4**	**PM686B- Deadline 4**	**84 hrs**	**84 hrs**	**Fri 10/30/20**	**100%**	**Fri 11/13/20**
90	✓		5.4.1	Draft and Submit Final Presentation	40 hrs	40 hrs	Fri 10/30/20	100%	Fri 11/13/20
91	✓		5.4.2	Format and Submit Final Report	40 hrs	40 hrs	Mon 11/2/20	100%	Mon 11/9/20
92	✓		5.4.3	Update and Submit Final Schedule	4 hrs	4 hrs	Mon 11/9/20	100%	Tue 11/10/20
93	✓		**5.5**	**Uploads Results of Project**	**3 hrs**	**3 hrs**	**Mon 11/23/2**	**100%**	**Fri 11/27/20**
94	✓		5.5.1	Post Photos to online forum	1 hr	1 hr	Mon 11/23/20	100%	Tue 11/24/20
95	✓		5.5.2	Post Video to Community	1 hr	1 hr	Wed 11/25/2(	100%	Thu 11/26/20
96	✓		5.5.3	Post Lessons Learned in comments of Video/Photos	1 hr	1 hr	Fri 11/27/20	100%	Fri 11/27/20

Living Risk Register, Realization, and Response Log

WBS ID#	ID#	Task Name	Threat (T) / Opportunity (O)	Impact Type	Description of Risk	Probability Likely (0-100%) very likely	Impact Low (0-100%) Significant	Risk Level (L X I) 0-50% = Low 51-70% = Mo	Measure to be taken and specific actions to take.(e.g. *Respond* to happening, or initially *Mitigate, Transfer, Accept,* etc.)	Owner	Risk Realized?	Response Implemented
	21	3rd party records process	O	Scope	Mechanic has assistant that keeps portfolio of work	100%	50%	50%	Enhance	Mechanic	Y	Requested specific images for records
2.1.3	5	Step-by-step video available of process	O	Schedule	Many installation resources avaiable with different angles	80%	60%	48%	Enhance - google, youtube, forum members utilized for resources	Project Manager	Y	Consulted with forum members with similar products installed
2.1.4	7	Equipment Opportunity	O	Schedule, Budget	Posess Specialty tools that allow for quicker install (electric drill, etc)	70%	60%	42%	Enhance - use what is in posession, ask friends, colleagues, etc.	Project Manager	N	N/A
	22	PM overallocated	T	Scope	PM assigned new role that detracts from ability to devote work toward capstone	70%	60%	42%	Accept - work to accomplish all tasks on time	Project Manager	Y	PM assigned as Detachment Commander for Anchorage detachment, as well as House Mus for 49th State Brewery. PM Requested Overview project, which have been unable to remove factory hardware/install without damaging parts/injury -
4.20	16	Unable to Install Alone	T	Schedule, Budget	Bumper is too heavy to install without damage to vehicle or bumper	60%	60%	36%	Accept - reach out to mechanic prior to install for notice/scheduling compatibility to reduce impact to schedule	Project Manager	Y	
2.1.2	3	products on sale	O	Budget, Schedule	New customer incentive, holiday, military, etc	100%	30%	30%	Ehance - If near a holiday, wait for holiday; Email customer support for manufacturer/retailer directly instead of E-order through website	Project Manager	N	N/A
4.30	19	Damage During Testing	T	Schedule, Budget	bumper may be insufficiently mounted, torqued, or otherwise and come loose/free during testing	30%	100%	30%	Avoid - double check every point of contact, if mechanic used, have them double check torque	Project Manager	N	N/A
2.1.2	2	products outside planned expenditure	T	Schedule, Budget	No Products available within allowable cost (including shipping)	40%	70%	28%	Mitigate by overview research of general product costs to ensure capability	Project Manager	N	N/A
2.2.1	8	Bumper Out of Stock	T	Schedule, Budget	Lowest priced option for decided product may be out of stock	45%	60%	27%	Mitigate by emailing customer service if website shows no inventory to determine if backorder is in acceptable scheduling window; If not, accept and find next lowest cost option	Project Manager	N	N/A
2.1.4	6	Special Equipmet Required	T	Schedule, Budget	May require tools of different size, angles, etc to be able to tighten to specification	60%	40%	24%	Accept - check with mechanic (if used), buy tools, try to adapt what is in posession	Project Manager	Y	Mechanic and impact racket that accelerated process for reaching
	20	Bumper interferes with safety equipment	T	Scope	proximity sensors lose functionality (common)	100%	20%	20%	Accept - ensure mounting orientation matches factory specs	Project Manager	Y	PM discussed with others who have installed aftermarket bumpers, and this result is a concern. - Accept
4.20	17	Can't Contact Mechanic	T	Schedule	Cannot install alone, and cannot contact installation assistance	30%	65%	20%	Accept - plan for duration contingency of 1 to 2 business days	Mechanic	N	N/A
2.2.1	10	Bumper Lost In Shipping	T	Schedule	Bumper does not arrive as planned, due to logistic complications	20%	95%	19%	Accept-plan for duration contingency of 80 hours (2 weeks)	Supplier	N	N/A

WBS ID#	ID#	Task Name	Threat (T) / Opportunity (O)	Impact Type	Description of Risk	Probability Likely (0-100%) very likely	Impact Low (0-100%) Significant	Risk Level (L X I) 0-50% = Low 51-70% = Mo	Measure to be taken and specific actions to take.(e.g. *Respond* to happening, or initially *Mitigate, Transfer, Accept,* etc.)	Owner	Risk Realized?	Response Implemented
2.1.3	4	No lessons Learned available	T	Schedule	First documented project applying project management tools to diy automotive project, no resources to pull directly from	90%	20%	18%	Accept - document lessons learned to help future PMs	Project Manager	Y	Have Photographs of process for bumper replacement, as well as developing project documentation for future
2.2.1	9	Bumper Does not come with Skid Pl	T	Budget	Skid plate offers front end protection (part of the purpose of replacing factory bumper with steel)	85%	20%	17%	Accept-plan for cost contingency of up to $400	Project Manager	Y	$200 cost
2.4.1	13	Bumper Damaged	T	Schedule, Budget	Bumper arrives damaged from shipping/manufacturer	18%	90%	16%	Transfer - inspect upon delivery (Carrier holds insurance on product until it is signed for by customer). If delivered with no signature, accept and contact manufacturer/retailer with images as soon as	Supplier/Shipping	N	N/A
2.4.2	14	Improper Fitment	T	Schedule, Budget	bumper/body has become warped, unnoticably damaged until attempted to mount	20%	80%	16%	Avoid - climate-controlled storage until installation	Project Manager	N	N/A
2.30	12	Parts Missing	T	Schedule	Parts needed to assemble/attach bumper Missing	30%	50%	15%	Accept- plan for cost contingency of up to $30, using included inventory sheet may need to purchase parts	Supplier	N	N/A
ALL	0	Accident	T	Scope/Schedule	Damage Vehicle	10%	30%	3%	Mitigate - Drive Safely following traffic guidelines Transfer - have insurance on vehicle in case of "Total Loss", if value to repair does not exceed value of vehicle. Bumper purchased can be installed instead of OEM bumper by repair shop. Prepare cost contingency for towing, deductible, potential rental	Project Manager	N	N/A
2.2.1	11	Skid Plate Lost In Shipping	T	Schedule	Skid Plate does not arrive as planned, due to logistic complications	20%	40%	8%	Accept-plan for duration contingency of 80 hours (2 weeks)	Supplier	N	N/A
4.20	15	Bolt Mounts do not allign	T	Schedule	unable to Install Due to Powdercoating over adjustable mounts which makes the mounts unable to adjust to body of vehicle	80%	10%	8%	Mitigate by not installing installation brackets until after powder coat; accept if bumper is assembled with them mounted to bumper then knock loose with mallet	Project Manager	Y	Bolts jostled loose to make adjustment
2.1.1	1	Illegal alteration	T	Scope	Bumper Change would violate state laws regarding vehicle modification	6%	100%	6%	Accept - perform research before proceeding with project	Project Manager	N	N/A
4.20	18	Unable to Install Alone	O	Procurement	Make Good Contact for future projects to reduce cost, or increase availability.	60%	5%	3%	Enhance - be polite, try to find common ground, tip, etc.	Project Manager	Y	Mechanic showed up PM to assist with install, worked on simultaneous project parallel to bumper install while PM finished electrical sensor
		Risk Updates / Realizations following execution										

*Image file of Risk Toolkit. For workable spreadsheet deliverable see Risk Register Tab in Master Document Spreadsheet included in file.

INSTALLATION INSTRUCTIONS

PRO-MOD BUMPER

APPLICATION:
2019 Ram 1500 (Excl. 2019 Ram 1500 Classic; Rebel)

PART NUMBER:
58-41075

CONTENT

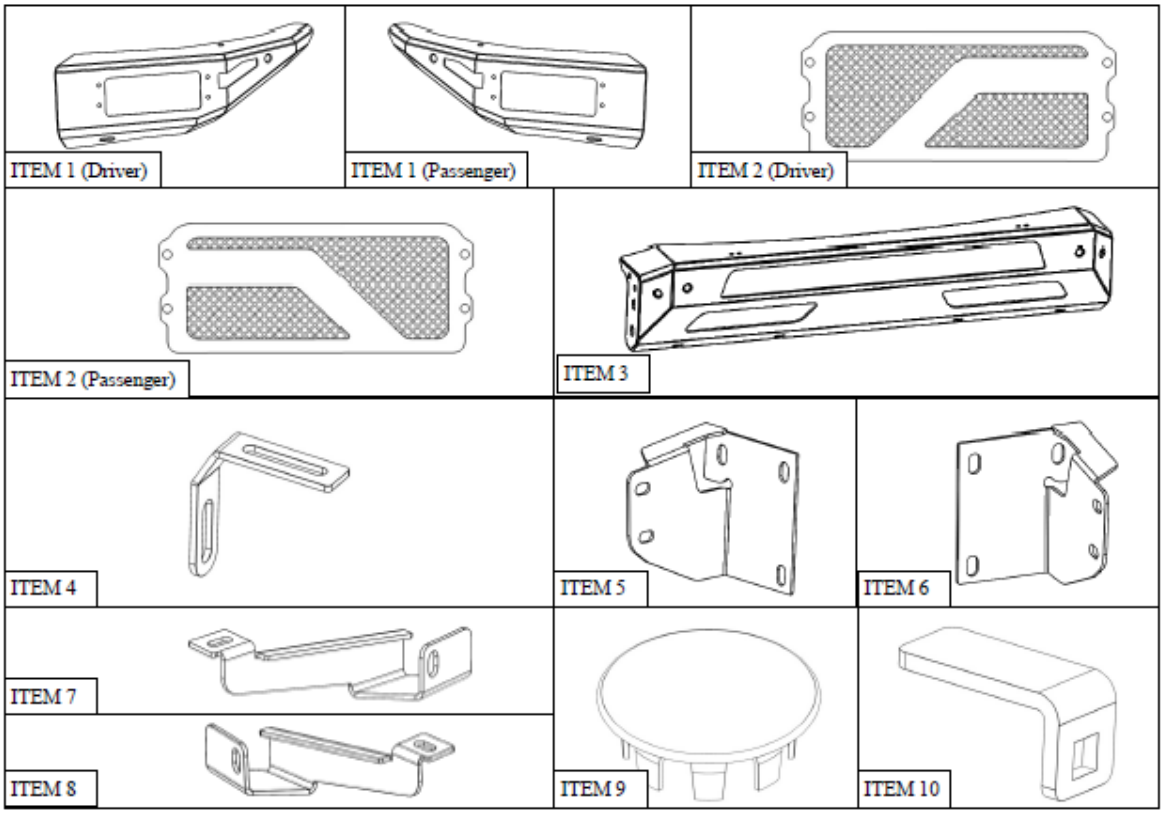
ITEM	QUANTITY	DESCRIPTION	TOOLS NEEDED
1	2	SIDE POD ASSEMBLY (1 DRIVER, 1 PASSENGER)	10MM SOCKET
2	2	MESH SIDE COVERS (1 DRIVER, 1 PASSENGER)	10MM WRENCH
3	1	CENTER SECTION	13MM SOCKET
4	1	LED LIGHT BRACKET	13MM WRENCH
5	1	DRIVER MOUNTING BRACKET	16MM SOCKET
6	1	PASSENGER MOUNTING BRACKET	16MM WRENCH
7	1	PASSENGER SUPPORT BRACKET	18MM SOCKET
8	1	DRIVER SUPPORT BRACKET	19MM WRENCH
9	6	HOLE PLUG	RATCHET
10	6	SENSOR TAB	TORQUE WRENCH
11	10	M12 HEX HEAD BOLT (YELLOW ZINC)	
12	10	M12 HEX NUT (YELLOW ZINC)	
13	20	M12 FLAT WASHER (YELLOW ZINC)	
14	10	M12 SPLIT LOCK WASHER (YELLOW ZINC)	
15	6	M6 CARRIAGE BOLT (YELLOW ZINC)	
16	6	M6 SPLIT LOCK WASHER (YELLOW ZINC)	
17	6	M6 HEX NUT (YELLOW ZINC)	
18	12	M6 FLAT WASHERS (YELLOW ZINC)	
19	6	M10 SPLIT LOCK WASHER (BLACK ZINC)	
20	12	M10 FLAT WASHER (BLACK ZINC)	
21	6	M10 HEX HEAD BOLT (BLACK ZINC)	
22	6	M10 HEX NUT (BLACK ZINC)	
23	12	M6 FLAT WASHER (BLACK ZINC)	
24	12	M6 SPLIT LOCK WASHER (BLACK ZINC)	
25	4	M6 BUTTON HEAD BOLT (BLACK ZINC)	
26	12	M6 SERRATED FLANGE NUT (BLACK ZINC)	

ANTI-SEIZE LUBRICANT MUST BE USED ON ALL STAINLESS STEEL FASTENERS TO PREVENT THREAD DAMAGE AND GALLING

Westin Automotive Products, Inc.
320 W. Covina Blvd
San Dimas, Ca. 91773

Thank you for choosing Westin products
for additional installation assistance please call
Customer Service (800) 793-7846
www.westinautomotive.com

P.N. 75-5841075-RevA ECO #: W18-0236 DATE: 02/27/19



PROCEDURE

1. Remove contents from box, verify if all parts listed are present and free from damage.
   Carefully read and understand all instructions before attempting installation.
   Failure to identify damage before installation could lead to a rejection of any claim.

2. Unplug any connections to the OEM front bumper (sensors, fog lights ,etc).
3. Remove the front inner fender pieces by removing the 5 screws shown in **Figure 1.**
4. Remove the three frame mounted bolts from each side of the vehicle. Then, carefully remove the OEM bumper. See **Figure 2.**

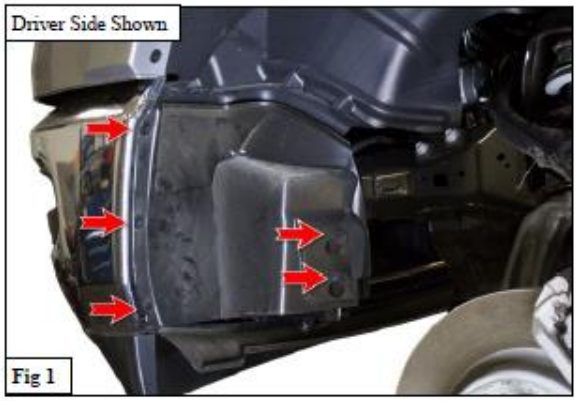


Fig 1

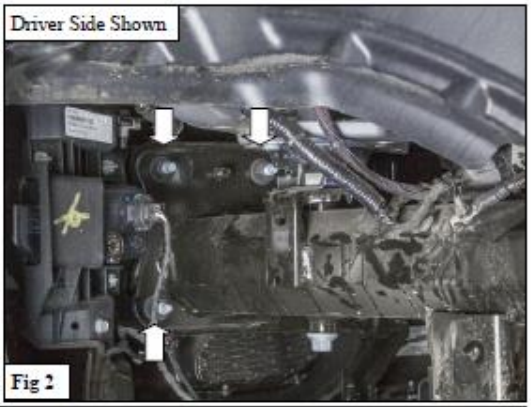


Fig 2

5. Unplug and remove the active valence from the vehicle if equipped. See **Figure 3.**


Fig 3

6. Use the supplied M10 Hardware to attach each Side Pod Assembly (1,2) to the Center Section (3). See **Figure 4.**
7. Tighten side pods in position now. Torque M10 hardware to 38 ft-lbs.
8. Use the supplied M6 Hardware to attach the LED Brackets (4) to the center section. See **Figure 5.** *Note: If installing an LED Light Bar (sold separately), install it at this time.*

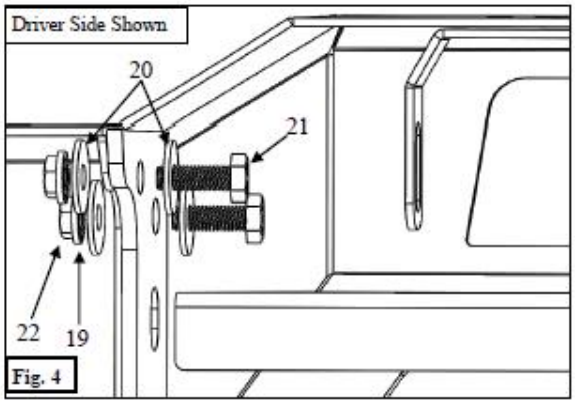


Fig. 4

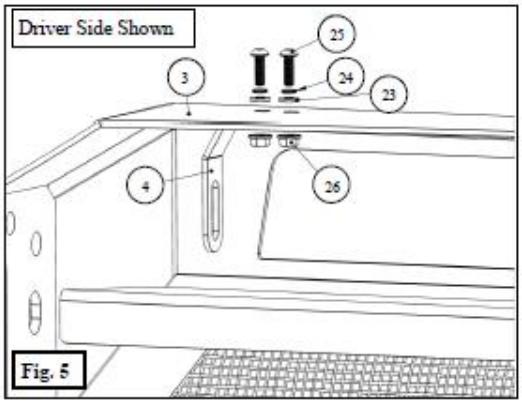


Fig. 5

8. Loosely install the bumper assembly to the Mounting Brackets (5,6) using the supplied M12 Hardware. See **Figures 6 & 7.**

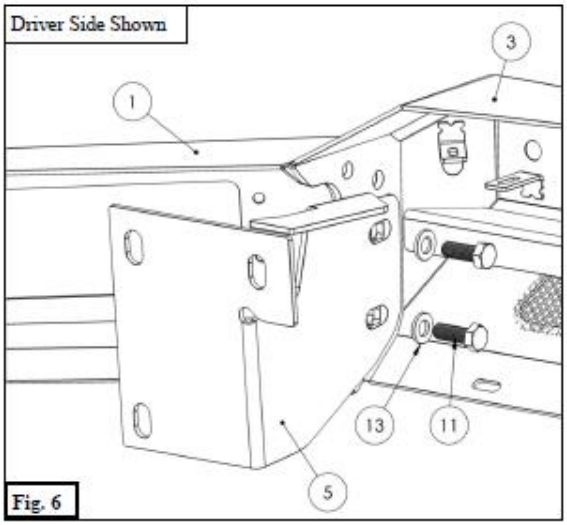


Fig. 6

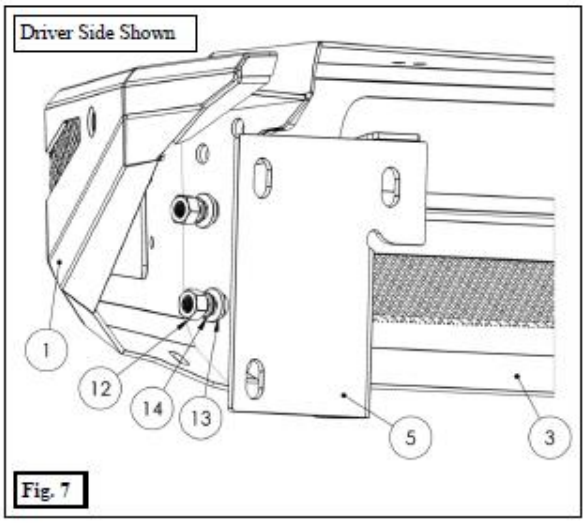


Fig. 7

PARKING SENSOR INSTALLATION

***If not installing sensors, install Hole Plugs (9) into holes on bumper and proceed.**

9. Remove the parking sensors from the OEM bumper. Pay attention to the orientation of the sensors. They must be installed in the same orientation. Handle sensors with care, they are very delicate .
10. Use the Sensor Tab (10) along with the supplied M6 Hardware (15-18) to install the sensors as shown in **Figure 8.**
11. Carefully route the harness around the bumper.

Note: Zip ties or double sided tape can e used to route harness and to hold the sensor in position.

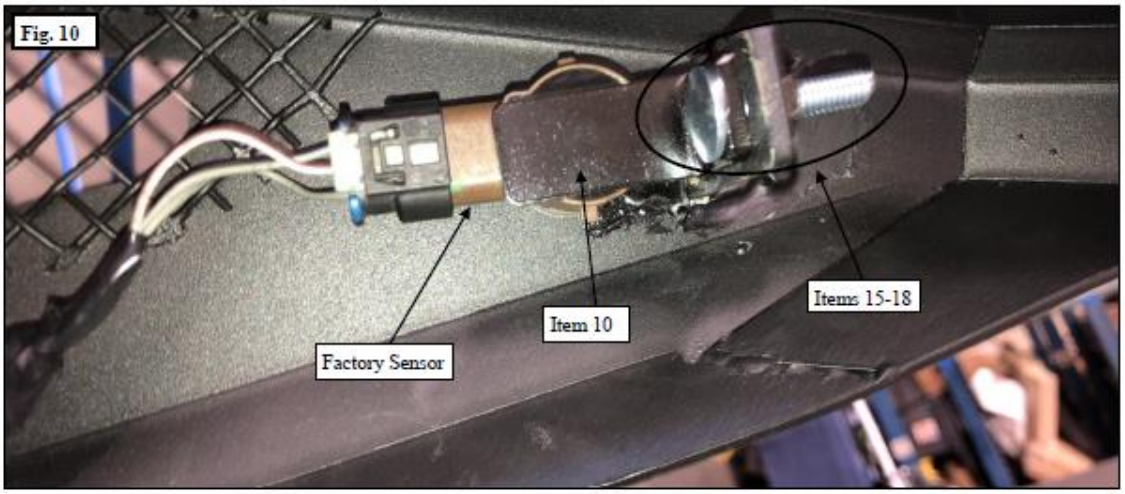


Fig. 10

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11. Loosely attach the preassembled bumper to the vehicle frame using the supplied M12 Hardware. See **Figure 9.**
12. Loosely attach the Support Brackets (7,8) to the rear of the mounting location for the bumper. See **Figure 10 and 11.**

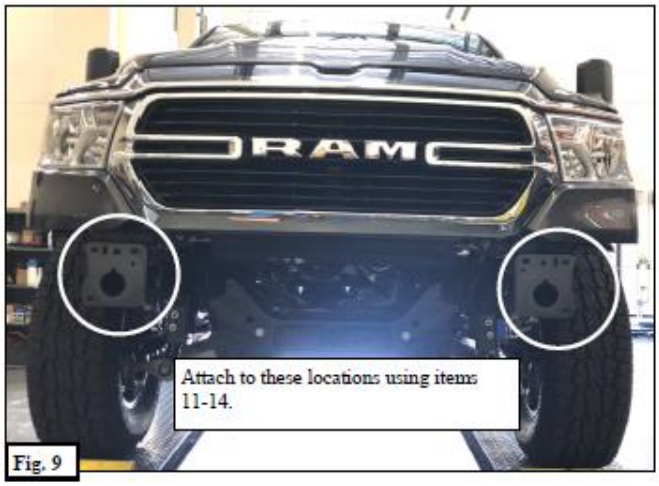

Fig. 9

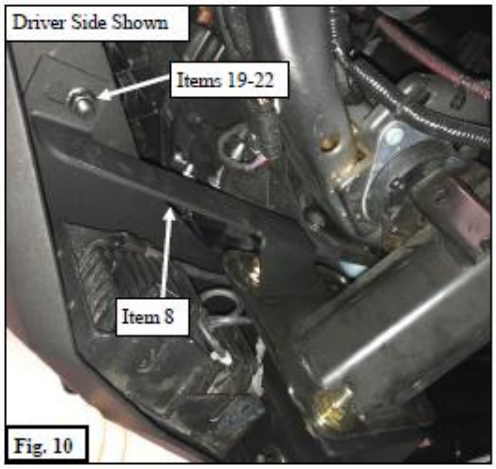

Fig. 10

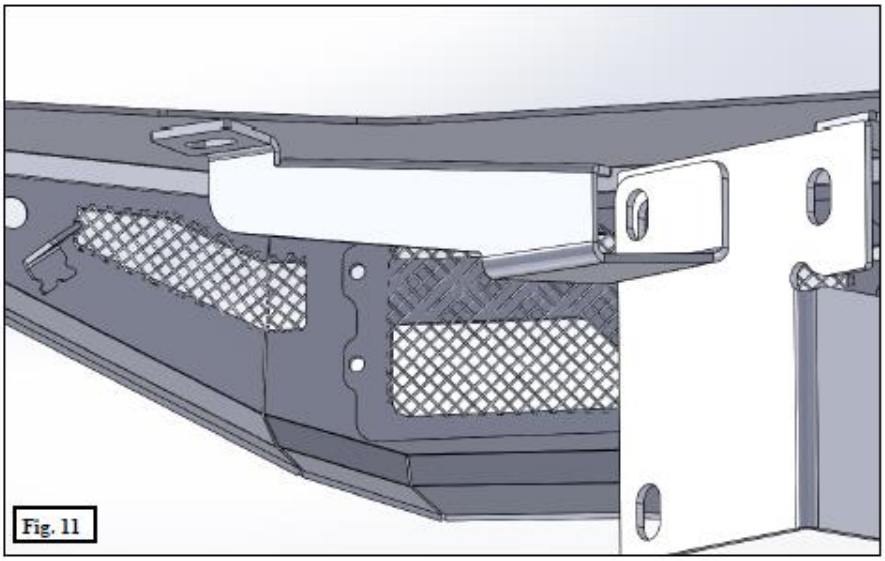
Fig. 11

13. Attach the Mesh Side Covers (2) to the Bumper using the supplied M6 Hardware. See **Figures 11 & 12.**

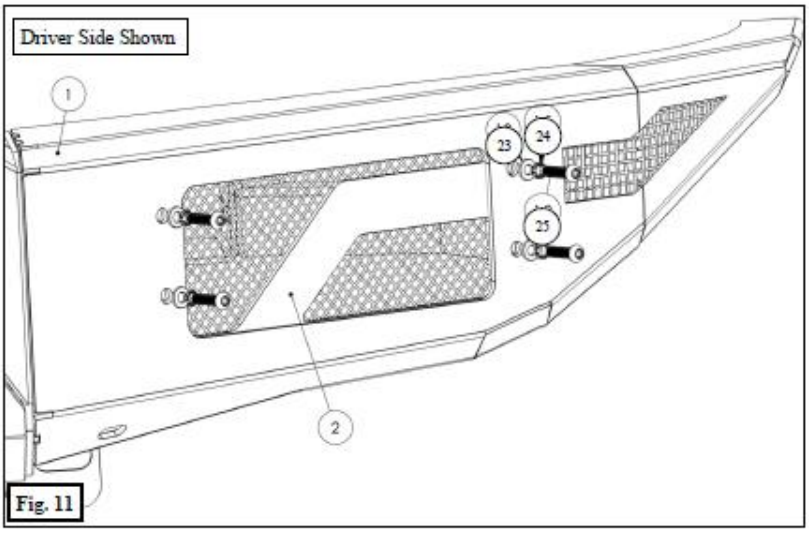

Fig. 11

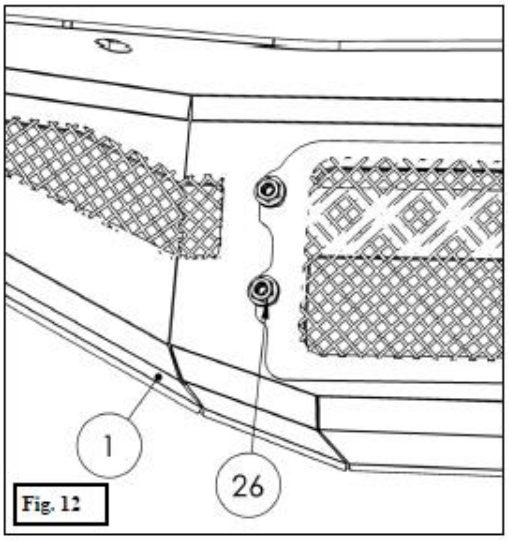

Fig. 12

12. Align bumper as desired and torque all hardware as specified: M6 to 7 ft-lbs, M10 to 38 ft-lbs, M12 to 60 ft-lbs.

INSTALLATION COMPLETE

LED Lights, side pod light mounts and skid plate sold separately

CARE INSTRUCTIONS

- REGULAR WAXING IS RECOMMENDED. DO NOT USE ANY TYPE OF POLISH OR WAX THAT MAY CONTAIN ABRASIVES.
- STAINLESS STEEL PRODUCTS CAN BE CLEANED WITH MILD SOAP AND WATER. STAINLESS STEEL POLISH SHOULD BE USED TO POLISH SMALL SCRATCHES.
- GLOSS BLACK FINISHES SHOULD BE CLEANED WITH MILD SOAP AND WATER

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⚠ WARNING ⚠

Failure to follow these instructions could lead to death, personal injury, and / or property damage.

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FASTENERS:
All Westin supplied fasteners must be utilized and installed in accordance with the installation instructions and apply torque to the specifications as defined. DOUBLE CHECK ALL FASTENERS BEFORE INITIAL USE, AND PERIODICALLY IN THE FUTURE TO ENSURE PROPER FUNCTION AND SAFETY.

DRILLING:
Most Westin products do not require drilling for installation. If drilling is defined as required, use caution when drilling a vehicle. FAILURE TO REVIEW AN AREA TO BE DRILLED MAY RESULT IN PERSONAL INJURY AND/OR INJURY TO OTHERS AS WELL AS VEHICLE DAMAGE.

EYE PROTECTION:
ALWAYS WEAR SAFETY GLASSES OR GOGGLES DURING THE INSTALLATION PROCESS TO AVOID PERSONAL INJURY.

MAXIMUM TOWING/CARRYING CAPACITY: (if applicable)
The Westin Receiver Hitches will have a visible tow rating label affixed directly on the product. User should never exceed the vehicle manufacturers maximum tow and weight rating regardless of the capacity of the hitch. FAILURE TO FOLLOW THESE GUIDELINES WILL VOID THE WESTIN WARRANTY AND MAY RESULT IN PERSONAL INJURY AND/OR INJURY TO OTHERS AS WELL AS VEHICLE DAMAGE.

FOR CALIFORNIA RESIDENTS ONLY-PROP 65 WARNING:
Some products may contain chemicals such as DEHP, which can cause cancer, birth defects or other reproductive harm. For more info go to www.p65warnings.ca.gov

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Procurement and Installation Lessons Learned

Part of the purpose of this project is to create information for interested parties in the future. With a lack of existing projects like this, Lessons Learned are critical contributions to source from. Lessons learned have been documented regarding the academic portion within the body of the project report, while lessons learned relating to the risk and procurement activities of performing the project are located below.

-Risk

A key consideration when planning any project is risk. Not documenting risk during planning or assessment can lead to overspending and unexpected scheduling discrepancies that result in incomplete or cancelled projects. When working on a vehicle, resources are invested, and risks are taken; both positive and negative. While cost can be reduced by not paying for ASE certified labor, a risk can be encountered potentially adding cost to a repair by needing the qualified professional undo the work that has been performed to get to the needed repair.

When assembling a product and having it powder coated or permanently fixed in place make sure that it is oriented exactly as it is desired to appear when installed. Fortunately, during this project the Project manager assembled the product prior to coating in a sufficient enough manner to be able to be fixed with negligible imperfections. Moving forward, the recommendation will be to have parts coated separately and assembled following the process.

When installing electrical components, ensure that all instructions are read carefully to prevent deficiencies. For example, when installing the proximity sensors, the instructions say to ensure that sensor orientation is paid close attention to as they are very sensitive. While the problem of them becoming unresponsive is very common; one instance has been recorded from installing this bumper and the sensors retaining functionality (this was when installed by bumper manufacturer and has been the only recorded instance of aftermarket bumper with different locations than factory bumper retaining functionality).

-Procurement

Much of the United States has become so efficient and cost competitive that free shipping is offered to almost of the 48 contiguous states, even on large items such as vehicle bumpers. Alaska would make sense to be able to include free shipping since most cost with shipping outside of the continental United States is accumulated through Customs, international tariffs, and other fares when delivering to other countries. Unfortunately, this is not the case, especially with oversized items. Many retailers will not consider shipping to Alaska and even fewer will consider the hassle of freight. A prime example that most Americans are familiar with is Amazon® Prime's free 2-day shipping. In Alaska, while there are some items that qualify for free shipping, not all will ship to this state. Those that do will not ship in 2 days; they will ship in 5 (depending on time of day ordered, evening orders expect 6 days). Even manufacturers such as Westin Automotive would not ship their own product to the state (freight was not a consideration from them), yet Amazon was able to affordably ship the bumper and skid plate.

While Amazon would ship the bumper selected for this project, other bumpers were not available for shipping from Amazon.